

PATENT SPECIFICATION

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(54) AUTOMATIC DEVICE FOR CARRYING OUT A SERVICE OR SALE ON CREDIT

(71) We, SOCIÉTÉ ANONYME FRANÇAISE DES APPAREILS AUTOMATIQUES SAFAA, a French Body Corporate, of 75 rue La Condamine, 75017, Paris, France, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a device adapted to be associated with means presenting a transaction, for enabling authorized users to accomplish this transaction on a credit basis, the transaction being invoiced by debiting an account, this device comprising means for receiving, from a user desirous to make a transaction on credit, confidential data transmitted without any material carrier, programmable checking means for checking whether said data are consistent with predetermined relationships unknown to the public, means connected to said checking means and controlling said transaction-presenting means in order to prevent said transaction whenever said data do not agree with said relationships, and permitting said transaction when said data are consistent with said relationships, and means for entering automatically a debit corresponding to the transaction thus accomplished into the account assigned to the user and determined unequivocally by said data.

35 The payment of the products or services offered by hitherto known automatic machines (such as penny-in-the-slot machines or the like) consists in either inserting cashes into the machine, if an immediate payment is required, or introducing a voucher or other element permitting the identification of the user (for instance a key, a card, etc.) if a deferred payment is contemplated, for instance by subsequently debiting a bank account or the like.

45 These various forms of payment are not only unreliable in case of one of the many vandalistic acts likely to be committed against the machines but also objectionable on account of the very limited comfort offered to the

user, not to mention the necessity of making heavy initial investments and paying heavy expenses for the subsequent maintenance of the machines so that the diffusion of such machines has been rather limited on the whole.

50 It is an object of the present invention to enlarge considerably the field of application of the devices permitting an automatic transaction on a credit basis, by providing an improved device characterized by a high degree of safety in actual service, without requiring the introduction or insertion of material objects, and adapted to be constructed at a relatively low cost.

55 According to this invention, there is provided a device adapted to be associated with means presenting a transaction, for enabling authorized users to accomplish this transaction on a credit basis, the transaction being invoiced by debiting an account, this device comprising means for receiving, from a user desirous to make a transaction on credit, confidential data transmitted without any material carrier, programmable checking means for checking whether said data are consistent with predetermined relationships unknown to the public, means connected to said checking means and controlling said transaction-presenting means in order to prevent said transaction whenever said data do not agree with said relationships, and debiting means for entering automatically debit corresponding to the transaction thus accomplished into the account assigned to the user and determined unequivocally by said data, this device being associated with a conventional telephone set with a switch hook, said transaction consisting of a telephone connection, and comprising a push-button for releasing the telephone line without clearing down the debiting means, said push-button being separate from the switch hook of the telephone set.

85 In a preferred embodiment, the means for receiving from a user the confidential data aforesaid comprise a keyboard or dial adapted to convert the actuation by the user of this keyboard or dial into electric data signals and

a "black box" for memorizing these electric data signals; the means for controlling whether the confidential data are consistent or not with pre-recorded relationships comprise the aforesaid black box also adapted to code electric data signals for converting them into coded signals, and a logic code circuit adapted to check said coded signals; the means for controlling other means presenting a transaction comprise the aforesaid logic code circuit also adapted, according to the results of the operations performed by this circuit in connection with said coded signals, to generate electric control signals capable of modifying the state of the transaction presenting means, and means for debiting the corresponding account with the sum constituting the counterpart of the transaction thus made, which means comprise an interface invoicing circuit receiving coded signals designating the account to be debited and other signals corresponding to the debit value, and an invoicing memory coupled to said interface invoicing circuit.

The device according to this invention may be considered, for the transaction permitted thereby, as constituting a closed-circuit system, from the dual point of view of thermodynamics — since it does not exchange any mass with the outside during this transaction — and physics — since it is free of any aperture, so that it can be constructed in a compact form, thus limiting considerably the risks of damages. Moreover, the automatism of the device according to this invention may be either local or partially centralized. In this last case, the protection against the risks of damages is of course much greater.

The device according to this invention may be associated with all types of apparatus or systems presenting a service or a product, to enable authorized users to take advantage of this service or product on a credit basis.

However, the construction and mode of operation of the device according to this invention will appear more clearly as the following description proceeds with reference to the attached drawings illustrating diagrammatically by way of example the mode of operation of the device associated with a telephone set in order to permit the payment of the telephone call or calls by subsequently debiting an account allocated to the user. In the drawings:

Figure 1 is a block diagram of the device of this invention;

Figure 2 is a block diagram of a modified embodiment of the device of the instant invention;

Figure 3 is a block diagram of another form of embodiment of the invention;

Figure 4 is a diagram showing a multiplexing system suitable for use in conjunction with a plurality of devices according to this invention;

Figure 5 is a diagram showing more in

detail a circuit incorporated in the device of this invention;

Figure 6 is a detailed diagram of an accessory;

Figure 7 is a detailed diagram showing another circuit of the device of this invention;

Figure 8 is a detailed diagram showing another device incorporated in this invention;

Figure 9 is a detailed diagram showing another circuit;

Figure 10 is another detailed diagram of a circuit of the device of this invention.

The telephone line to which the device according to this invention is connected is adapted to retransmit in the form of frequency signals the telephone call charges.

The telephone set equipped with the device according to this invention comprises the following devices put at the user's disposal:

- a keyboard or dial 1 (Figure 1);
- a conventional telephone set 2, possibly incorporating a keyboard or dial 1;
- preferably, an illuminated annunciator 3 remaining de-energized as long as the device is inoperative.

The mode of operation and utilization of the device according to this invention will now be described in detail in the following paragraphs A:

A.1. An authorized user, desirous to make a telephone call on a credit or deferred payment basis, takes up the hand microphone of a telephone set 2 (Figure 1).

A telephony interface circuit 9 detects this "hand microphone take-up" position and returns a dialling tone to the telephone set 2 so that the user can hear this tone and know that he can continue the necessary call process. The announcer 3 remains de-energized.

A.2. The user then strikes or dials on the keyboard or dial 1 (incorporated or not in the telephone set 2) the first figure or digit of a series constituting a personal number assigned confidentially to the user. This personal number constitutes a complete set of confidential data enabling the device of this invention to identify the user and ascertain his right to take advantage of the solicited transaction.

In fact, this personal number not only contains data permitting of identifying the account or bank funds to be debited but must also, in order to be acknowledged as valid, consist of figures corresponding to relationships unknown to the public.

Immediately upon striking or dialling of the first figure the telephony interface circuit 9:

- acknowledges this first figure and transmits same for memorization to a black box 7;

- controls the flashing of all the figures of
announcer 3 which for the time being
comprise only "0"s;
- stops the dialling tone requesting the
dialling of the personal number;
- starts the search process along the black
list through a black list logic circuit 6.

A.3. The user strikes or dials on keyboard
1 the other figures of his personal number.
As the user strikes or dials his other figures
on the keyboard, these are transmitted in the

TABLE

Figures of personal number	Order:	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th
Value:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Figures of coded personal number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Order:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Value =	7	5	1	11	9	6	10	4	8	3	2	15	13	12	14	

25 The relationship shown by the arrows in
the preceding Table, that is, in short, the
coding operation performed by black box 7,
is unknown to the public.
The code selection, from a human point
of view, may be considered as being infinite,
since the assembly of 15 figures as given
hereinabove provides 10¹⁵ possible combina-
tions.
The coded personal number may in the

abstract be considered as consisting of several groups of at least one figure having a well-defined meaning.

Thus, for instance, figure 1' (equal to 7 in the example) may designate a class of services permitting of restricting the use of the telephone station to town calls, trunk calls, international calls, etc.

Figures 2' and 3' (5 and 1) may designate the invoicing centre of the user;

Figures 4' to 9' (11, 9, 6, 10, 4, 8) may designate the number of the user's account;

Figure 10' (3) may refer to the validity of the black box code; in fact the validity in time of the personal numbers may be limited by changing periodically these numbers and the black box coding; in this case, numeral 10' may indicate the validity period of the code. Moreover, to facilitate the change of programming of black box 7, the latter may be so programmed that two different personal numbers can be accepted for each user during the time period necessary for changing the coding of all the black boxes of the invention which are kept in operation;

Figures 11' to 14' (2, 15, 13, 12) may designate a control number connected by logic relationships to the account number;

Figure 15' may be a key-number permitting of checking the compatibility of all the figures dialled by the user;

A comparison between the figures of the personal number or of the coded personal number and a list may be made. The purpose of this comparison is to prevent a user holding a valid personal number but inscribed on a so-called "black list" from utilizing the service or making a transaction. The black list may be recorded on a cassette tape and the so-called "black list" logic circuit 6 may check, as the figures are typed, if the typed combination is contained or not in this list.

Moreover, the figures of the coded personal number must check internal logic relationships before this number is acknowledged as valid.

To simplify the disclosure, it may be assumed for example, that the 11th figure (equal to 2) of the coded personal number, belonging more particularly to the group constituting the number for checking this coded personal number, must in all cases be the complement to 9 of another figure, for instance 1st (equal to 7) of the coded personal number, without checking the other figures.

For this purpose, a code logic circuit (5) accomplishes monitoring operations on the figure of the coded number; in the selected example this circuit 5 checks the accuracy of the relationship $1' + 11' = 9$.

A4.1 If the figures utilized for this monitoring step do not confirm the preset internal logic relationships, or if the black list logic circuit 6 detects that the personal number is on the black list, the code logic circuit 5 puts out the illuminated annunciator 3 and the

user must hang up the receiver.

Moreover, the logic circuit 5 may account the number of wrong successive diallings and penalize the user of the telephone station during a predetermined time period (for instance 3 minutes) after three consecutive unsuccessful attempts. Then an information is available during this time period, possibly for warning a local authority responsible for the telephone set or station.

A4.2 If the figures utilized for the checking or monitoring operation are consistent with the required internal logic relationships, and if the black list logic circuit 6 does not find the personal number in the black list, then the code logic circuit 5 switches the telephone station 2 on the public telephone system *a, b* and causes the annunciator 3 to change from its "0" flashing condition to its continuous "0" displaying condition.

A.5. In this last instance the user may dial the call number of the called or desired telephone subscriber.

A5.1 The telephony interface circuit 9 detects and memorizes the first figures of this call number and may possibly compare them with the figure 1' of the coded personal number contained in the code logic circuit 5. This constitutes a checking of the user's right of taking advantage of the services or transactions of a certain class. In fact, the first figures of a telephone call number determine if the call is a town call, a trunk call or an international call, etc., and a user may for instance not be allowed to obtain international calls on credit. This limitation of the utilization will appear from the coded personal numbers of the user, for example in figure 1', and the telephony interface circuit 9 may thus detect an incompatibility between the figure 1' of the coded personal number and the first figures of the called telephone number, in case the user would attempt to make a call to which he is not entitled.

In this case, the code logic circuit 5 will deliver to the interface circuit 9 the order necessary for putting out the announcer 3, this entailing for the user the consequences described in paragraph A4.1 hereinabove.

A5.2 If the user strikes or dials a wrong number or if he cannot have the proper connection for any reason, he simply depresses a push-button 14 provided on the device of this invention, and this will cut off the connection with the telephone exchange which, when the user releases this push-button 14, emits the tone signalling that the user can renew his call by dialling again.

A5.3 If the user is not desirous to renew his call, he simply hangs up the hand microphone on the switching hook of the telephone. This condition is detected by the interface circuit 9 which puts out the announcer 3 and sets the device in a waiting condition.

A5.4 If the user is desirous to make another

call, he strikes or dials the telephone number of the called telephone subscriber.

5 A5.5 If the connection is obtained, the telephone exchange delivers a first call-charge counter 10; the announcer 3 displays the condition of this counter and therefore the presence of a tax due.

10 A5.6 The user talks with the called subscriber; if new call-charges are worked out by the telephone exchange, they are accounted in counter 10 and displayed on announcer 3.

15 The use of the telephone set at this station may be limited as to the number of call-charge units or taxes, or maximum price, per call. This limitation may be either fixed (for example wired) or subordinate to the user's code. In this last case, the information concerning this limitation may be contained in figure 1' of the user's personal coded number.

20 If for a given call the user remains within this limit, the conversation is not interfered with. When the limit is attained, an invoicing interface circuit 11 receiving the necessary information from the call-charge unit counter 25 10 and code logic circuit 5 issues an order to the telephony interface circuit 9 for interrupting the telephone call in progress and causes the recording of the authorized call in an invoicing memory 12 according to a process described in paragraph A5.6.1.

30 At the end of the telephone talk, two possibilities are afforded to the user:

35 A5.6.1 If he is desirous to end the transaction definitively, he hangs up the hand microphone.

40 In this case, the telephony interface circuit 9 detects this action and issues a "recording" order to the invoicing interface circuit 11 which, from the information contained in counter 10 and code logic circuit 5, produces an intelligence to be transmitted to the invoicing memory 12 (consisting, for example, of a tape mini-cassette), shapes this intelligence and controls the recording thereof. At the end of this recording, the invoicing memory 12 45 emits an end of intelligence signal controlling via said interface circuit 11 the resetting of all the logic circuits of the device.

50 An advantageous feature characterizing the device of this invention is that no intelligence can be recorded in the invoicing memory 12 unless at least one call charge has been delivered by the telephone exchange.

55 According to a modified arrangement, the invoicing interface circuit 11 may comprise a logic circuit enabling it to record in a location reserved for this purpose in the invoicing memory the reference data affording a subsequent tracing of the recording medium (for example a mini-cassette) in both time and 60 space.

65 Optionally, the device may also comprise an attachment delivering to the user a ticket mentioning for example the call number of the called telephone subscriber and the number of

call-charge units accounted to the user.

For this purpose, the telephony interface circuit 9 further comprises a system capable of detecting and memorize the call number on the public telephone line *a, b*, the invoicing interface circuit 11 permitting the printing of an invoice or toll ticket in a recording unit 13. 70

Moreover, the invoicing memory 12 may operate according to three main principles: 75

1) This memory 12 may firstly be a local one; the invoice recording means (for example one or more tape mini-cassettes) is read periodically and transmitted to the invoicing office either by direct transfer or by using public transport means, for example by post. In this last case an employee may be entrusted with the transport of the recording means; 80

2) The invoicing memory 12 may then be of local nature but coupled to means permitting the automatic transmission, on the telephone line, of its contents corresponding to a group of different talks; in this case the transmission order may be issued either from the telephone exchange in the form of a specific train of pulses, for instance at a frequency of 12 KHz, this train of pulses being detected by a receiver 8 and recorded by the interface circuit 9, or by an internal periodic clock incorporated in the invoicing interface circuit 11, or alternatively by any suitable circuit when the invoicing memory 12 is full or saturated. 85 90 95

The invoicing data are transmitted through the telephone lines by means of a pulse transmitter operating at a frequency of, say, 12 KHz, which is incorporated in the telephony interface circuit 9 and controlled by the invoicing interface circuit 11. 100

3) Finally, the invoicing memory 12 may be centralized. In this case, the data are transmitted on the telephone line not for a group of different connexions or talks but for each of them when the hand-receiver is hung again. The data are transmitted in the same fashion as in the preceding case. 105 110

A5.6.2 Should the user wish to make another call, he depresses the line release push-button 14. Thus, the telephone exchange equipments are released or disengaged and the user will hear again the tone of the public telephone system. Then, the condition is the same as that described from paragraph A5.2 on, except that the number of call-charge units displayed by the announcer 3, which corresponds to the preceding call, will be completed by the number of additional call-charge units accounted by the telephone exchange for the new talk. 115 120

If the new call number dialled by the user does not correspond to the class of services he is entitled to, two possibilities of operation of the device according to this invention may be contemplated for preventing the user from taking advantage of this service: 125

- Either the line is cut off and the invoicing interface circuit 9 is caused to perform a recording cycle similar to that obtained when the hand microphone is hung up;
- 5 — Or the dial (or keyboard) is short-circuited and the user must depress again the line release push-button.

Optionally, the device of this invention may comprise another means permitting of releasing the equipment after a predetermined time period. To obtain this function, a clock inserted in the invoicing interface circuit 11 delivers after a predetermined time period an order similar to that resulting from the hanging up of the hand microphone.

A6.1 The coding programme of the black box and/or the contents of the black list may be modified through local or centralized operations.

20 In the first case, this modification is accomplished by replacing a local support or recording medium (for example a tape mini-cassette) containing the black box programme and/or the black list data.

25 In the second case, this modification is obtained by applying to the telephone line a , b a sequence of pulses, for example at a frequency of 12 KHz, such that it cannot be intermingled with the call-charge pulses. These signals are fed to the pulse receiver 8 and identified in the telephony interface circuit 9; then, they are fed to black-box and/or black-list logic circuits 6, 7, respectively, thus changing automatically the programming of these circuits without requiring any local intervention.

A6.2 To avoid the installation of expensive equipments in public places, one portion of the device of the instant invention may be centralized.

40 In this case the system corresponds to the block diagram of Figure 2 and is divided into a centralized portion PC and a peripheral portion PP. Each element PP1, ... PPn of the peripheral portion PP, which are the only ones accessible for the users, comprises the keyboard or dial 1, the telephone set 2, the announcer 3, the interface circuit 4 (if the dial 1 is not an integral part of the telephone set 2), the line release button 14, the invoice or toll-ticket recorder 13 and one portion 9¹ of the telephony interface circuit. Each element PC1 ... PCn of the centralized portion PC of the device according to this invention, to which the public telephone system a , b is coupled, comprises one portion 9² of the telephony interface circuit, black box circuit 7, the pulse receiver 8, the call-charge counter 10, the invoicing interface circuit 11, and the invoicing memory 12.

60 The data required for display purposes or for printing the toll-ticket are transmitted via modulators and demodulators incorporated in portions 9¹ and 9² of the telephony interface

circuit to the telephone lines a and b .

A6.3 In case one portion PC of the device according to this invention were centralized, the assembly of logic circuits of the centralized portion of Figure 2 may be grouped, and each one of the data transmitted to or from n peripheral devices PP1 ... PPn may be processed successively in a same equipment.

In this case the system assumes the structure illustrated in Figure 3 in which the centralized portion PC of the device of the instant invention comprises n unitary portions PU1, ... PU n coupled to the public system a , b , and a portion PR common to said unitary portions PU1, ... PU n . This common portion PR comprises a code logic circuit 5¹, a black list circuit 6¹, a black box circuit 7¹, a telephony interface circuit 9¹, a call-charge counter 10¹, an invoicing interface circuit 11¹, an invoicing memory 12¹ and an analyzing or searching device 15 connected to n unitary portions PU, ... PU n . The logic blocks 5¹, 6¹, 7¹ are similar to logic blocks 5, 6, 7 but may be faster than these last-mentioned blocks. In addition to the functions of interface circuit 9², the aforesaid interface circuit 9¹ receives data from counter 10¹ and retransmits them with due consideration for the data received from analyser or searcher 15. The logic blocks 10¹, 11¹, 12¹ may comprise up to n blocks 10, 11, 12, respectively. The unitary portions PU1, ... PU n of the centralized portion PC comprise a pulse receiver 8, an interface circuit 9¹ and an AND circuit.

A6.4 A multiplexing system M illustrated in Figure 4 of the attached drawings may be associated with a set of devices according to this invention for distributing a predetermined number k of telephone lines to a number n of telephone stations, n being greater than k .

A6.5 To permit an additional limitation in the service granted to a given user, certain applications may justify the use of an additional checking or monitoring device (coded card, key, etc. ...) added to the personal number. In this case, the dialling of the personal number is taken into account only if the checking device introduced by the user is acknowledged as valid.

A6.6 If the called telephone subscriber is busy, an optional accessory may be provided for periodically re-dialling the call number, without compelling the user to dial his personal number again.

A6.7 The code logic circuit 5 may comprise a clock compelling the user to dial one or more figures of his personal number according to a confidential periodicity, to permit the acknowledgement of the validity of this number. This periodicity may be displayed on the announcer 3.

A6.8 If more than three successive false or erroneous personal numbers have been dialled on the keyboard, or if a logic defects

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appears, an alarm or warning circuit is energized to inform the local personnel responsible for the system (see A4.1). More particularly, this alarm circuit may be utilized for warning a local responsible employee in case the device according to this invention did not acknowledge any personal and valid number, as a consequence of a failure. The alarm signal may be transmitted to the telephone exchange and the device of this invention is then put in an inoperative condition. Under these circumstances, when the user takes up the hand microphone, he does not hear any tone.

The operation of the device according to this invention will now be described in detail in paragraph B hereinafter, of which the various divisions correspond to those of paragraph A, respectively.

It is assumed that a device according to this invention is coupled to a line a, b, of a public telephone system which is adapted to retransmit call-charges in the form of frequency signals.

The above-defined assembly comprises:

- 25 — A keyboard 1;
- A telephone station 2 supporting said keyboard 1. Telephone stations of this type are well known from the prior art and widely used;
- 30 — An illuminated annunciator 3 consisting of three decades of displaying elements comprising each seven electroluminescent segmental diodes; and
- 35 — A push-button 14 for disengaging or releasing the line, at station 2.

The interference circuit 4 is no more necessary when the keyboard 1 is incorporated in station 2, since the keyboard telephone set will shape automatically the orders struck on the keys;

40 B.1 The user takes up the hand microphone of telephone set 2 (Figure 5); the current delivered from a d.c. source 9d flows through the keyboard set via:

- 45 — Back contacts 9c and 9b;
- An emitter diode 9f1 of a photocoupler;
- An RC-type oscillator 9a;
- An inverter 9e in its inoperative position.

Therefore, the oscillator is operative and delivers to the user or dialling tone at a frequency of about 600 Hz.

Moreover, the transistor 9f2 of the photocoupler, to which a voltage V is fed, receives the light flux from diode 9f1.

55 The signal $\bar{\alpha}$ representing the output signal Q of a D-type memory 9k3 (for example such as marketed by RCA under the reference symbol C D 4013) is delivered to "1" via an inverter 9k1 and remains there due to the OR gate 9k2 coupled to the input D of said memory 9k3. The signal $\bar{\alpha}$ at "0"

keeps the device of this invention in its inoperative condition. A clock 9h delivers two pulse signals H₁ and H₂ having the same repetition frequency (1 KHz) but spaced in time so that the pulses of one of the two clock signals be interposed between those of the other clock signal. Signal H₁ is fed to the clock input of memory 9k3.

Finally, no control order BL1 or BL2 is fed to the annunciator 3 (Figure 6), consisting for example of AFF announcers of the Hewlett Packard 5082 type and of decoders DEDC of the RCA CD 4511 type, and therefore this annunciator remains non-energized and dark.

B.2 The user depresses on the keyboard 1 the key corresponding to the first figure of his personal number.

The interface circuit 9 is normally expected to acknowledge this first figure.

This is obtained as follows:

When the user depresses a key of keyboard 1 (Figure 5), the logic circuit associated with this keyboard produces a number of current cut-offs equal in number to the figure carried by the depressed key (therefore from 1 to 10 cut-offs, figure "0" corresponding to 10 cut-offs). These cut-offs last at least 40 ms and at the most 80 ms; they take place at a rate of about 10 Hz. Moreover, a train of cut-offs corresponding to one figure cannot be followed at a time period of less than 500 ms by a train of cut-offs corresponding to another figure.

B.2.1 If the user depresses, say, key "2" at time t₀,

- Photo-transistor 9f2 is blocked during at least 40 ms;
- The output of inverter 9k1 passed through "0" together with the signal α corresponding to the signal of output Q of memory 9k3, a pulse counter 9k6 (such as an RCA CD 4020 pulse counter) counts the clock pulses H₂ at 1 KHz.

B.2.2 After about 30 ms, the output 06 of counter 9k6 is switched to "1".

- Thus, one unit is recorded in a pulse counter 9k18 connected to the output of counter 9k6 and consisting for example of none-half of a circuit known under the trade name "MOTOROLA MC 14 520".
- On the ascending leading edge of the next pulse the output Q of a D-type flip-flop 9k8 (for example a RCA CD 4013 flip-flop) is switched to "1" and remains in this position via an OR circuit 9k7.

B.2.2 After about 30 ms, the output 06 of counter 9k6 is switched to "1".

- Thus, one unit is recorded in a pulse counter 9k18 connected to the output of

- counter 9k6 and consisting for example of one-half of a circuit known under the trade name "MOTOROLA MC 14 520".
- 5 — On the ascending leading edge of the next pulse the output Q of a D-type flip-flop 9k8 (for example a RCA CD 4013 flip-flop) is switched to "1" and remains in this position via an OR circuit 9k7.
- Therefore:
- 10 — Signal BL1 controlling the announcer 3 oscillates as a function of the rhythm set up by an oscillator 9k10 through an AND circuit 9k11.
- Consequently, the three display decades of
- 15 announcer 3 are caused to flash, displaying the number "000".
- A relay 9e is energized via an amplifier 9k9; thus, oscillator 9a is short-circuited and a fixed resistor 9g is substituted therefor. Thus, the user does not hear the tone anymore.
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- B.2.3 About 50 ms after to transistor 9f2 is again saturated;
- The output of inverter 9k1 turns to "1";
- 25 — A counter 9k5 (for example RCA CD 4020) and counter 9k6 are reset to "0";
- The resetting input R of a counter 9k13 (such as RCA CD 4020) is zeroed and therefore the counter counts the pulses H2.
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- B.2.4 Since the figure struck on keyboard 1 is "2", transistor 9f2 is blocked, 100 ms after to, as a consequence of the absence of current in diode 9f1,
- 35 — The output of inverter 9k1 is zeroed.
- The counter 9k13 is reset through the output of an OR circuit 9k19;
- The counter 9k6 counts the pulses H2.
- B.2.5 After 30 ms, the output Q6 of counter
- 40 9k6 is set to "1";
- One unit is recorded in counter 9k18 so that the latter will display two units.
- B.2.6 After 5 ms, transistor 9f2 is again conducting;
- 45 — The resetting signal of counter 9k6 comes to "0", therefore its output Q6 comes to "0";
- figures dialled in the order:
- | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|--|---|---|---|---|---|---|---|---|---|----|----|
- figures corresponding to the coded personal number and their order:
- | | | | | | | | | | | | |
|---|----|----|----|----|----|----|----|----|----|----|-----|
| { | 7 | 5 | 1 | 11 | 9 | 6 | 10 | 4 | 8 | 3 | 2 |
| | 1' | 2' | 3' | 4' | 5' | 6' | 7' | 8' | 9' | 1' | 11' |
- The resetting signal of counter 9k13 comes to "0" and counter counts the H2 pulses.
- B.2.7 After 250 ms:
- 50 — The output Q9 of counter 9k13 comes to "1" and is kept in this position by an OR circuit 9k12;
- One unit is recorded in a counter 9k14 (consisting for example of a half circuit "MOTOROLA MC 14520") thus displaying "1";
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- A conventional pulse selector 9k15 delivers at its output 5 one and a single pulse H2 following the rising wave-front of the signal fed to its input E.
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- Since the counter 9k14 is at "1", the output $\beta 1$ of decoder 9k16 switches to "1" during the output signal S of selector 9k15. This signal $\beta 1$ permits of introducing the information contained in counter 9k18 (that is, 2)
- 65 into the 1st-figure memories of black box 7. On the other hand, a simple logic circuit 9k20 converts the BCD "10" information into "0". At the end of pulse $\beta 1$ a negative wavefront differentiator 9k17 of conventional type resets the counter 9k18.
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- B.2.8 The search on the black list consists in reading for example on the tape of a conventional mini-cassette the information contained therein through the medium of a reading interface circuit of a type known per se.
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- B.3 The user strikes on keyboard k1 the other figures of his personal number.
- 80
- As a consequence of pulse $\beta 1$ produced by the interface circuit 9 the signals present on bus lines BE1 to BE4 are recorded in memory 7a1 (consisting for example of a half-circuit MOTOROLA 14508). The recording code is of the BCD type (see Figure 7). Assuming that the user's personal number comprises 11 figures, the interface circuit 9 will deliver at its outputs i ($i=2 \dots 11$), in the same manner as for the first figure, a pulse signal at the end of the striking or dialling of each figure which will permit the introduction, into the black box memories, of the code corresponding to this figure and is contained in counter 9k18.
- 85
- 90
- 95
- 100
- B.4 At the end of this dialling, the eleven figures of the user's personal number are memorized in black box 7 (illustrated in Figure 7) which comprises circuits capable of coding figures dialled or struck on the keyboard. Now let us consider a correspondence having for instance the following form:

Each one of the dialled eleven figures is memorized in a group of four memories constituting one-half of a MOTOROLA Type MC 14508 circuit. To find again the correspondence between the dialled or struck figures and the corresponding figures of the coded personal number, it is only required to reinsert the corresponding non-indexed rank figure into the memory of rank n' ($n'=1' \dots 11'$).

For example, assuming that the first figure to be struck or dialled is the third one of the coded personal number in the above-given example, signal 1 will control the introduction of the code BCD of the first dialled or struck number into the third memory.

Each group of memories of rank n delivers on the four bus lines BS1 to BA4 the data contained therein when a signal γ_n is fed to the corresponding input.

In the present example the personal number is constituted as follows:

- figures 1' to 7', gives the number of the user's account,
- figures 8' to 11', gives the user's check number.

If an additional figure for the service class has to be taken into account, it will be necessary to detect the dialled or struck number after obtaining the connection with the telephone line of the public system a, b , which would be possible without difficulty through a circuit similar to the telephony interface circuit 9.

The thus detected figures would be memorized as they actually are in the above-mentioned black box 7, and compared with the first figure of the code. If this comparison gives a negative result, a general resetting order is issued.

The user's account number must correspond to a check number according to one or a plurality of predetermined relationships.

Let us assume that the necessary correspondence be such that the first figure 1' must be the complement to 9 of the figure of control number 11'. The other figures are not checked.

It is obvious that this very simple relationship is applicable to all figures and complicated if desired by selecting one of the many possible combinations of bits of certain figures between them, taken either from the personal coded number consisting of the complete sequence of dialled or struck figures, or from these two numbers. However, the checking principle remains unchanged, only the static or dynamic coding evolves.

Figure 8 of the drawings shows more in detail the component elements of the code logic circuit of this example. At the end of the dialling or striking operation, signal β_{11} comes to "11". The differentiator 5b of conventional type generates a pulse on the

descending front of this signal. This pulse opens the gates towards the output bus lines BS1 to BS4 and BC1 to BC4 for the data contained in memories 7a1 and 7a11 by means of signals γ_1 and γ_{11} . Therefore, the output of an adder 5c (for example a MOTOROLA MC 14008 type circuit) delivers the sum of the two figures representing the first figure of the user's coded account number and the last figure of the check number.

If the sum is equal to 9, the output of AND circuit 5f is set on "1" and on the descending front of the output signal of differentiator 5b another differentiator 5g generates a pulse which, via AND circuit 5j, is memorized in a memory 5l (for example of the MOTOROLA MC 14013 type). The output of this memory is noted μ_b ; it controls via amplifier 5m the relays 9b and 9c of interface circuit 9. Thus, the user is connected to telephone system line a, b .

In case the figures of the application number (from 1' to 7') do not agree with those of the check number (from 8' to 11'), the output of AND circuit 5f is at "0" and the signal μ_d of memory 5k (for example MC 14013) comes to "1" (signal μ_b remaining on "0"); this is attended by the putting out of announcer 3 as a consequence of the blocking of AND gate 9k21 (see Figure 5) and the system remains in this condition until the hand microphone is hung up again.

In this example, only one relationship between the account number and the check number is possible. To ensure the validity of two relationships at a given moment, it is only necessary to generate two pulses at the end of signal β_{11} , and to process the first pulse in the same manner as the pulse delivered by differentiator 5b, and the second pulse in a similar way but by introducing a different relationship.

Memory 5l would be controlled at "1" if either of the checkings were positive when the two relationships are permitted, or only if the first relationship is obtained in case only this first relationship is valid.

Also in this example the programming of the relationship between the code and the personal number is wired; however, it could be automatic by utilizing the telephone line as a carrier, the data being coded and decoded in a circuit of the modulator-demodulator type known per se.

B.4.1 If the check figures disagree, annunciator 3 is put out and the system remains in this condition until the hand microphone is hung up again. This hanging up is detected by counter 9k5 of which the resetting R was removed immediately at the cutting off of the line current, as detected by the phototransistor 9f2, inverter 9k1 and an OR circuit 9k4.

About 500 ms after the hand microphone was hung up, the output Q10 of counter 9k5

is restored to "1" if no call charge was applied to the user, as in the present case; a monostable flip-flop 9k22 delivers a general resetting order Z via an AND circuit 9k23 and an OR circuit 9k26.

5 B.4.2 If the coded personal number is consistent with the desired connection, the telephone system line a, b is given or connected to the user (by controlling relays 9b and 9c) and annunciator 3 switches from the flashing condition to the fixed display of "000".

10 In fact, as the call-charge counter is at "0", the signal BL2 comes to 1 and the display shows the condition of this counter, as will be explained presently.

B.5 The user strikes or dials the number of the called telephone subscriber.

20 B.5.1 It is unnecessary to describe in detail the circuits for detecting the subscriber's number, or the circuits for comparing the first figure of the coded personal number 1', for these circuits are similar to those performing identical functions and already described in the foregoing.

25 B.5.2 If the user dials or strikes a wrong number or if the connection is not established, the user depresses push-button 14 (see Figure 5), thus cutting off the telephone line.

30 B.5.3 If the user is not desirous to re-dial, he hangs up the hand microphone, and this action is detected and processed in the manner described in paragraph B.4.1.

35 B.5.4 If the user is desirous to make another call, he dials or strikes the number of his correspondent or the desired telephone subscriber, since his telephone set is connected directly to the telephone line (a, b) through the call-charge receiver 8.

40 B.5.5 If the user's connection with the desired subscriber is obtained, the telephone exchange delivers a first call-charge tax pulse recorded by the pulse receiver 8.

45 This receiver is of a known type for example of the 12 KHz/50 Hz type, and delivers at its output a signal t at "0" when a call-charge tax for example at 12 KHz has been delivered by the exchange. Figure 9 of the drawings shows the counter 10 operating as follows:

50 Signal t inverted by an inverter 10a controls the input of a monostable flip-flop 10b delivering a gauged pulse at its output. This pulse is accounted in a three-decade counter BCD (10c, 10d, 10e) the outputs of which are displayed by the illuminated annunciator 3. Moreover, the output signal Mt of a memory 10f (for example MC 14013) is switched to "1" and remains in this condition after receiving this first call-charge tax.

60 B.5.6 The user talks with his correspondent; if new taxes are calculated at the telephone exchange, they are recorded in decades 10c, 10d, 10e, and displayed by annunciator 3.

65 To limit the number of taxes of the telephone call or calls, it is only necessary to

decode the three decades 10c, 10d and 10e at a predetermined level, according to any known and suitable means and to deliver a logic information similar to that delivered in case of hand microphone hanging-up when this threshold is attained.

B.5.6.1 If the user is desirous to end completely his transaction, he hangs up the hand microphone.

75 This action is detected by interface circuit 9 as already described hereinabove (see paragraph B.4.1).

80 However, since signal Mt was switched to "1", the interface circuit 9 delivers not a resetting order Z but a recording signal ϵ via AND circuit 9k24.

Figure 10 of the drawings illustrates the invoicing interface circuit 11.

85 The order ϵ is memorized by memory 11b (for example of the MC 14013 type) and constitutes through the medium of amplifier 11d a recording order OE for the interface circuit of the recorder which may consist for example of a type-214 IER printer.

90 On the other hand, the order ϵ increments by one unit through an OR circuit 11e the counter 11f (for instance of the MC 14520 type) which is thus switched from state "0" to state "1". This condition is decoded by a decimal binary decoder 11h (for example of the MC 14514 type) so that the output S1 of this decoder switches to "1" and the signal γ_1 comes to "1".

100 Consequently (see Figure 7 of the drawings) signal γ_1 comes to "1" through OR circuit 7a12.

105 The data contained in memories 7a1 are thus carried by bus lines BS1 to BS4 and since the input KA of AND/OR circuit 11g (for example of the RCA CD 4019 type) (Figure 10) is in state "1", these data are delivered to the recorder on wires of weight 1, 2, 4 and 8.

110 When the recorder has taken into account the data concerning the first figure, it retransmits to interface circuit 11 the "recorded figure" information CE which, via OR circuit 11e, increments by one unit the counter 11f which assumes the state 2. Consequently, the output S2 of decoder 11h switches to "1" and the information contained in memories 7a2 is fed to the lines of weight 1 to 8 through a circuit similar to the one described hereinabove.

120 Then the recorder takes into account the seven figures of the user's application number; when these figures are recorded, the counter 11f is in state 8, so that the output S8 of decoder 11h is at "1" and the figure corresponding to the hundreds of the number of call-charge taxes is fed to the lines of weight 1, 2, 4, 8, leading to the recorder. Similarly, the AND/OR circuit 11i (for example of the RCA CD 4019 type) permits the transfer of the tens figure, and also of the units, of the 130

number of taxes (signals γ , and γ_{10}).

At the end of the recording cycle the recorder issues an order FCE differentiated by a conventional-type differentiator 11n controlling the input of a monostable flip-flop 11m delivering at its output a signal z forming via an OR circuit 9k26 a general resetting signal Z.

Consequently, the information comprising:

- 10 — The inputation or application number,
- The call-charge taxes number

are recorded on a magnetic tape or any other suitable carrier, and the device of this invention resumes its inoperative condition.

- 15 B.5.6.2 If the user is desirous to make another call, he depresses push-button 14 for releasing the line, as already explained. When he releases this push-button the user hears the dialling tone of the telephone system and
- 20 dials another number.

- 25 The taxes concerning this new connection will be added to the preceding ones and the assembly will be carried in one time to the user's account when he hangs up the hand microphone according to the process described in paragraph B.5.6.1.

- 30 Of course, the forms of embodiment of the invention which are described hereinabove with reference to the attached drawings should not be construed as limiting the scope of the invention, since they are given by way of example and illustration, not of limitation, to which many modifications and changes may be brought without departing from the scope of the invention as defined in the following claims.
- 35

WHAT WE CLAIM IS:—

- 40 1. Device adapted to be associated with means presenting a transaction, for enabling authorized users to accomplish this transaction on a credit basis, the transaction being invoiced by debiting an account, this device comprising means for receiving, from a user desirous to make a transaction on credit, confidential data transmitted without any material carrier,
- 45 programmable checking means for checking whether said data are consistent with predetermined relationships unknown to the public, means connected to said checking means and controlling said transaction-presenting means in order to prevent said transaction whenever said data do not agree with said relationships, and debiting means for entering automatically debit corresponding to the transaction thus accomplished into the account assigned to the user and determined unequivocally by said data, this device being associated with a conventional telephone set with a switch hook, said transaction consisting of a telephone connection, and comprising a
- 50 push-button for releasing the telephone line without clearing down the debiting means,
- 55
- 60

said push-button being separate from the switch hook of the telephone set.

- 2. Device according to claim 1, characterized in that it comprises a call-charge announcer.

- 3. Device according to claim 2, further comprising a telephony interface circuit connected to said announcer and to the telephone set in order to control the flashing of said announcer when a user begins to transmit confidential data to the device.
- 70

- 4. Device according to any of claims 1 or 2, further comprising a telephony interface circuit connected to the hand microphone of the telephone set in order to stop the hand microphone dialling tone of the telephone set when a user begins to transmit his confidential data to the device.
- 75
- 80

- 5. Device according to any of the preceding claims, comprising means for controlling the interruption of the connection obtained by a user when the debit corresponding to this connection corresponds to a predetermined maximum value.
- 85

- 6. Device according to any of the preceding claims, comprising means for preventing, during at least a predetermined time period, any connection following a predetermined number of unsuccessful attempts to operate the device.
- 90

- 7. Device according to claim 5 or claim 6, which is connected to a warning device.

- 8. Device according to any of the preceding claims, in which said means for entering a debit into an account comprise an invoicing interface circuit and an invoicing memory, said invoicing interface circuit being prevented from transmitting any debit entering signal to said invoicing memory when no telephone connection has been established.
- 95
- 100

- 9. Device according to any of the preceding claims, wherein said means for entering a debit into an account comprise an invoicing memory, said invoicing memory being a local one and connected to means capable of transmitting its contents automatically.
- 105

- 10. Device according to any of the preceding claims, further comprising a telephony interface circuit and at least one call-charge tax counter.
- 110

- 11. Device according to any of the preceding claims, said programmable checking means being so programmed that during a predetermined time period at least two different sets of confidential data are adapted to check the relationships suitable for authorizing said telephone connection.
- 115

- 12. A plurality of devices according to any of claims 1 to 10, and a multiplexing system associated with the devices in order to distribute a predetermined number k of telephone lines among a number n of telephone sets, with n constantly greater than k .
- 120

- 13. Device according to any of claims 1 to 10, wherein said programmable checking means are programmed by delivering to a
- 125

line a series of pulses detected by a member of said device.

- 5 14. Device according to any of claims 1 to 10, characterized in that, of the confidential data assigned to each user, one fraction is intended for displaying in the device the group of telephone connections that the user is authorized to make.

15. Device adapted to be associated with means presenting a transaction, for enabling authorized users to accomplish this transaction on a credit basis, the transaction being invoiced by debiting an account, the device being substantially as hereinbefore described with reference to the accompanying drawings. 10 15

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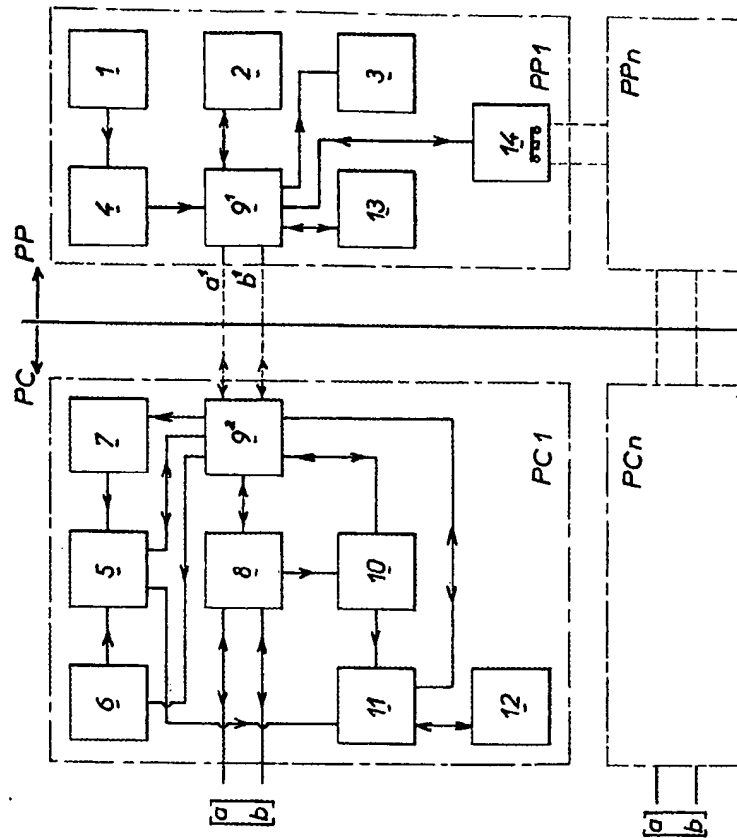


Fig. 2

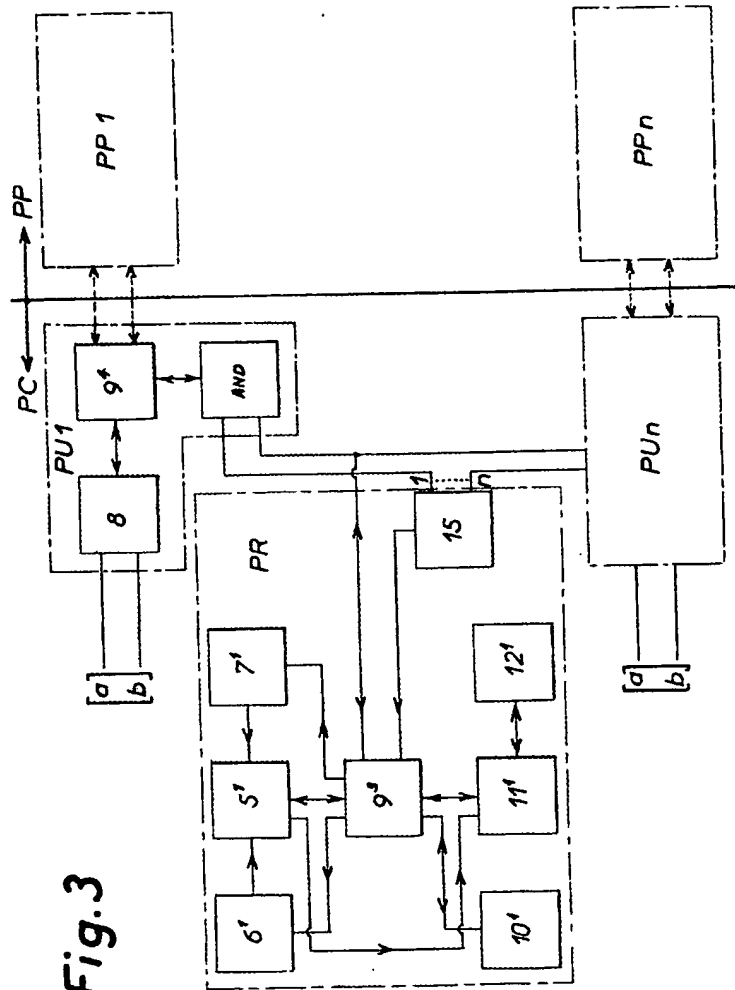


Fig. 6

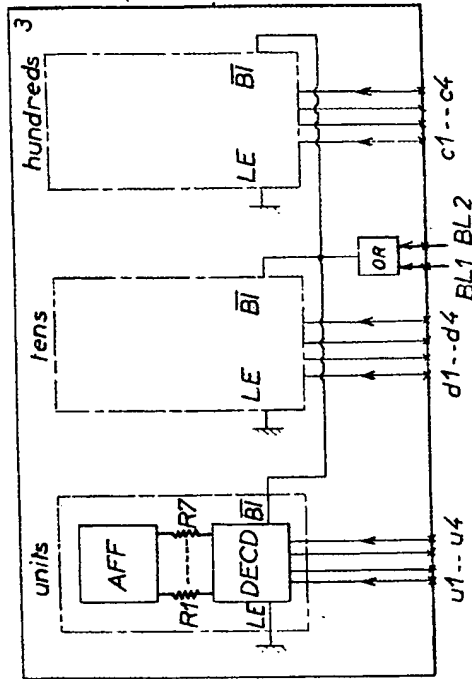


Fig. 4

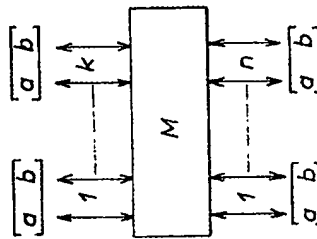


Fig. 5

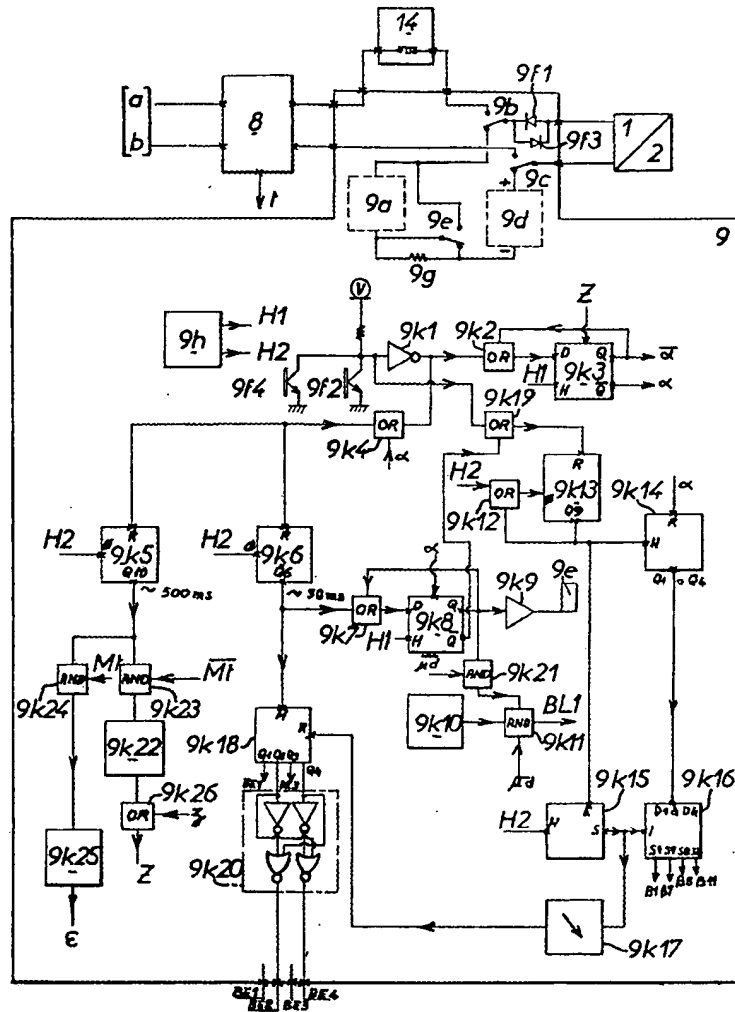


Fig.7

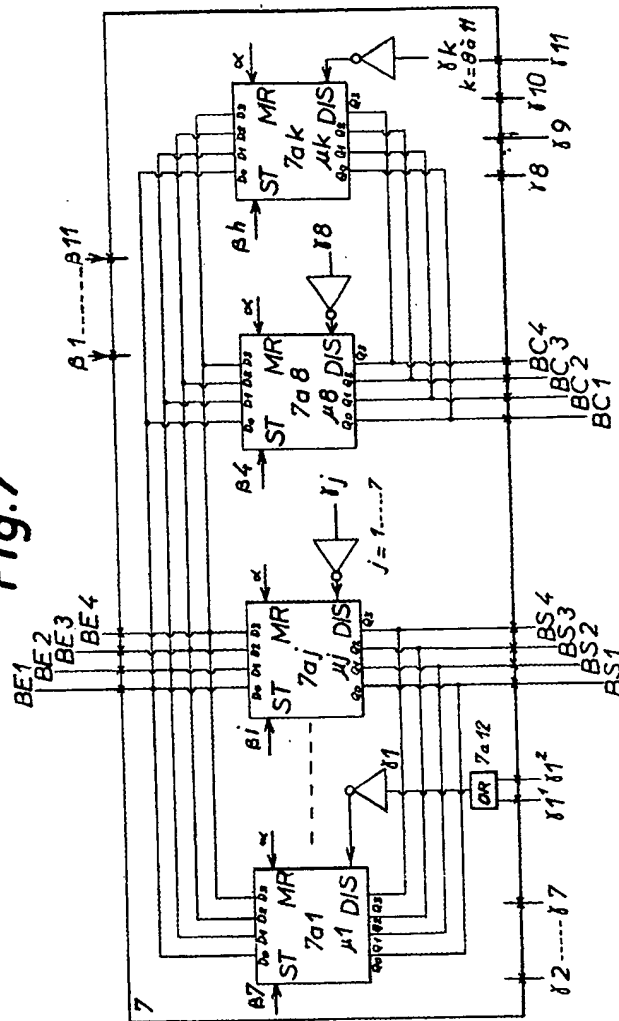


Fig.9

The diagram illustrates a 10's complement divider circuit. It takes a dividend d and a divisor t as inputs. The divisor t is inverted and passed through a 10's complement block $10a$ to produce $10b$. The dividend d is also passed through a 10's complement block $10b$ to produce $10c$. The circuit then uses three 10's complement blocks $10c$, $10d$, and $10e$ to produce the quotient Mf and remainder Mf .

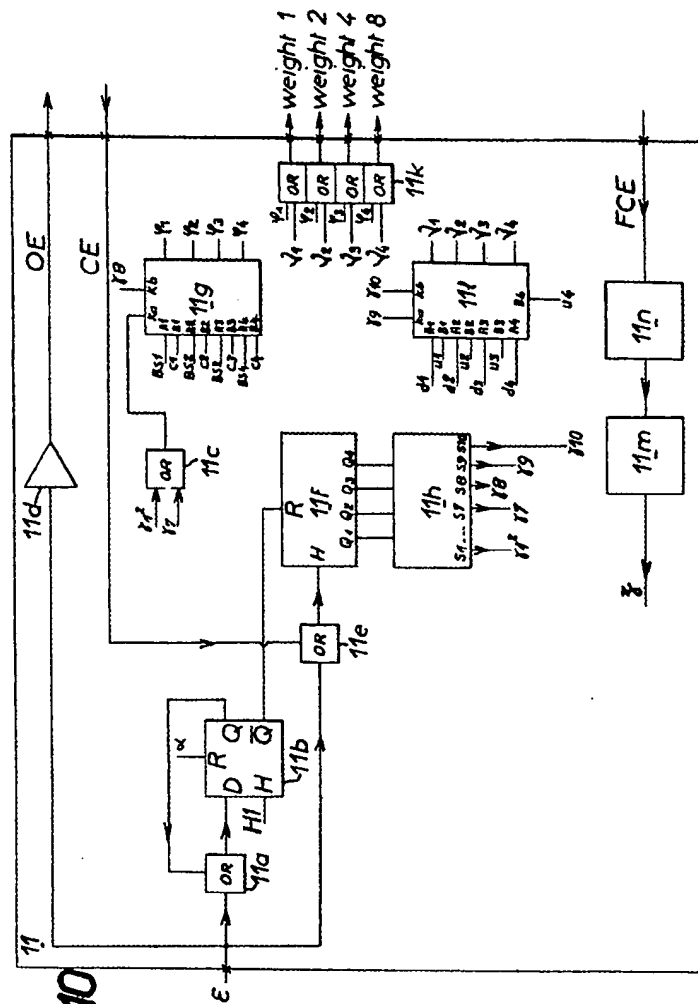


Fig. 10

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